Economic Analysis and Life Cycle Costing
Section I

Economic Analysis and Life Cycle Costing

- Engineering Economy and Economics
  1. Several questions on basic economics.
  2. Several problems on simple engineering economy.
  3. Several problems requiring command of engineering economy (internal rate of return, present worth, after tax cash flows, etc.).
- Simplifying assumptions
  1. Most problems involve an investment now (T=0) with annual savings (cost) each and every year for the life of the project.
  2. The life of the project and the equipment life will be given and they will usually be equal.
  3. The cash flow frequency and the compounding periods will match and will usually be annual.

TERMS:

SOME TEXTS MAY USE DIFFERENT TERMS.

1. Annuity (A) – a series of equal cash flows that occur evenly spaced over time. For this course we use ordinary annuities, meaning that cash flows occur only at end of year. A is also known as the Annual Amount (most often a savings).

2. Depreciation - Amount of economic value that is used up during the accounting period. Depreciation is not a cash flow. It is for accounting purposes only.

3. Future Value (F) – the value of a single deposited amount or a series of payments at some point in the future.

4. Internal Rate of Return (IRR) - The discount rate at which the present value of a project costs equals the present value of the project savings.

5. Minimum acceptable rate of return (MARR) – The rate determined to be the minimum allowed for investments/ projects approved by a Company. (desired interest rate, hurdle rate, discount rate)

6. Net Present Value (NPV) - The difference between the present value of an investment's future net cash flows and the initial investment (if NPV is zero, the project would equate to investing the same amount of dollars at the desired rate)

7. Present Value (P) – the value of a future amount in today's dollars.

*****Important – Some Financial texts use Present Worth (PW) which is equivalent to Present Value

Also, Annual Value (AV) may be called Annual Worth (AW) by other texts

8. Simple Payback (SPB) - amount of time for a project to pay for itself while excluding the time value of money.

SPB = Investment/ Net Annual Savings

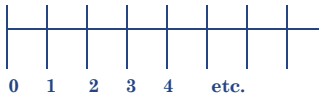
Example: A project has an investment of $100,000. Savings per year are $22,000 but added maintenance because of the project is $2000. What is the SPB?

Note: SPB does not consider interest and ignores the time value of money. Thus, SPB is not an accurate decision criterion; but everyone understands it (or think they do) and will likely always have it around. Used in proper fashion, SPB is not a bad "first cut" tool.

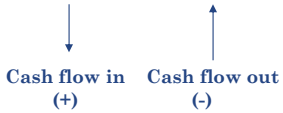
9. Salvage Value is the value of the equipment at the end of the project life. Sometimes salvage value is positive (sell it) and sometimes it is negative (pay to remove or dispose it). Salvage value is usually ignored in this section.

- Cash Flow Diagrams (CFD). The CFD is a drawing depicting the cash flows for the life of the project. This can be helpful for people that are new to this material to draw the CFD.

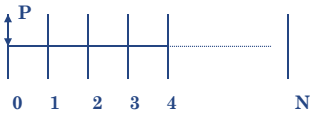
1) Cash flow diagram



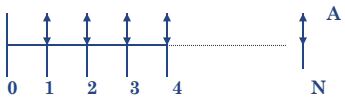
end of year



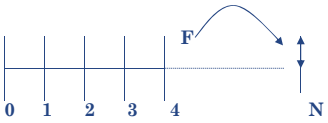
2) Cash flow diagram



"P" represents a Present cash flow. May be (+) or (-)



"A" represents an Annual cash flow. May be (+) or (-). Starts at end of year 1 and Continues through life of project (simplifying assumption).



"F" represents a Future cash flow. May be (+) or (-). Occurs at end of some future year (usually end of project).

Factors Given in Interest Tables

Find	Given	Factor	Other Title for Factor
F	P	F/P, I, N	SPCA
P	F	P/F, I, N	SPPW
F	A	F/A, I, N	USCA
A	F	A/F, I, N	SFP
A	P	A/P, I, N	CR
P	A	P/A, I, N	USPW

In almost all engineering economy problems, all of the following are known except for one. Solving for it completes the problem.

P,A,I,N Where I is known as the interest rate, discount factor, minimum acceptable rate of return, or (in some cases) internal rate of return.

Factors are tabulated in all Economy texts

What I want to know **Given What I do know**

- / - , I, N

( )

P/A, I, N

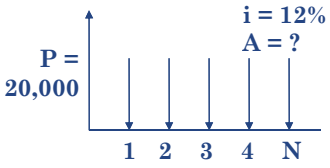
( )

"Find P given that A, I, and N are known"

Finding Savings Required and Cost examples

a) A boiler economizer will cost $20,000 installed. How much will it have to save each year (life = 5 years) to return 12%?

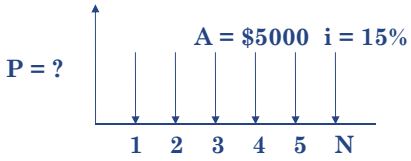
Here, P = $20,000, I = 12%, N = 5, A = ?



$$A = \$20{,}000 \; (A/P, 12\%, 5) \; (0.27741) = \$5{,}548 \text{ per year}$$

b) A new lighting system will save $5000 per year. How much can I pay and still get a 15% rate of return? Life = 6 years.

A = $5000/yr, I = 15%, N = 6, P = ?



$$P = \$5{,}000 \; (P/A, 15\%, 6) \; (3.7845) = \$18{,}922$$

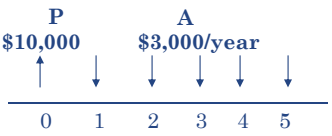
c) Net Present Value Analysis

Two insulation thickness are proposed for a project. The cost and savings vary as shown below. Which is better if a return of 15% is required?

Thickness	Cost	Yearly Savings	Life
1”	$10,000	$3,000	5 years
2”	$15,000	$4,500	5 years

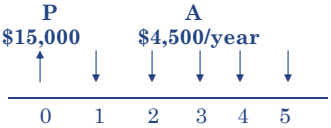
Cash Flow Diagrams

1



i = 15%

2



i = 15%

Calculate the NPV for each:

NPV = PVsavings – PVcost

NPV = annual savings *(P/A,I%,N) - Cost

NPV(0) = 0 (The do nothing project)

A (P/A, 15%, 5) Cost

NPV(1) = 3,000 (3.352) – 10,000 = $56

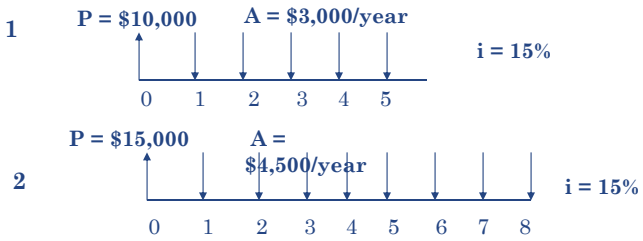
A (P/A, 15%, 5) Cost

NPV(2) = 4,500 (3.352) – 15,000 = $84

NPV(2) > NPV(1), so project two with 2 inches of insulation is more attractive.

d) Annual Value

What if Alternative two lasted 8 years and Alternative one lasted 5 years?



Since the project life spans are different, we calculate the Annual Value of Each Project using the formula below, and then compare the two AV's:

AV = A – P (A/P, I, N)

Project 1 AV = 3000 – 10,000(A/P, 15%, 5) = 3000 – 10,000 (.2983) = $17/yr

Project 2 AV = 4500 – 15,000 (A/P, 15%, 8) = 4500 – 15,000 (.2229) = $1,156.50/yr

Since Project 2's AV is > than Project 1's, select project 2

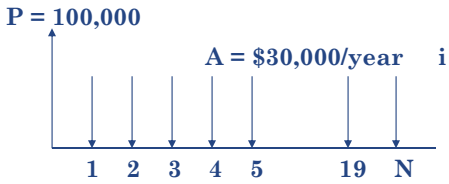
e) Internal Rate of Return

At some interest rate the present value of the investment is exactly equal to the present value of the annual savings. At this point NPV = ZERO, which means the return exactly equals the discount rate used. It can also be called the internal rate of return or true rate of return.

Example—What is the internal rate of return for installing a waste

heat recovery system, given:

First Cost = $100,000, Life = 20 years, Annual Savings = $30,000



Unknown

P A

$100,000 = $30,000 (P/A, I%, 20)

Thus (P/A, I%, 20) = 3.333

$100,000 = $30,000(X)

X = 3.333

Now, search the different interest tables until

you find the I where (P/A, I, N) = 3.333:

I = IRR = 30% (almost)

Hint: For IRR a good start is try I = A/P.

In our example, I = $30,000/$100,000 = 30% which is an upper limit for IRR.

For long periods of time (n = 20 or more) and high I this will be very close. For shorter n and smaller I, it is only a start and IRR will be less than I = A/P.

Simple Look at Taxes and Straight Line Depreciation

- To a tax paying business, the saving for an energy project is like income, and taxes may have to be paid on the savings.
- But assume that the costs of the project are deducted from the savings using straight line depreciation (SLD), meaning that you divide the cost by the project lifetime and subtract that amount from the savings each year.
- Example – A project costs $20,000, saves $6,000 a year and lasts five years.

Solution to Example

SLD = $cost/life = $20,000/5 = $4000/yr

So, the $6000/yr savings is reduced to
$6000 - $4000 = $2000/yr.

Thus, in this case, taxes would only have to be paid on the $2000/yr.

Time Value Of Money Problem Session

1) A heat wheel can be installed on your exhaust air system to preheat the make up air. The installed cost is $15,000 and the unit has an economic life of 10 years. How much must it save each year to return 15%?

2) A desuperheater can be installed on your refrigeration system to obtain free hot water. You estimate you can heat 150,000 litres of water per year from 15°C (city water entering temperature) to 60°C. This will replace a natural gas water heater that operates at 80% efficiency. You pay $10.00 per GJ for your gas. The unit has an economic life of 5 years. How much can you pay

for that unit and obtain a return of 12%?

3) A vendor proposes a retrofit lighting system. The system will cost $100,000 installed; but it will save $15,000 per year for the next 10 years. Your minimum attractive rate of return (interest rate) is 10%. Construct a cash flow diagram and calculate the NPV of the cash flow. Is this investment desirable?

4) An energy efficient air compressor will cost $30,000 installed and will require $1,000 worth of maintenance each year for its life of 10 years. Energy costs will be $6,000 per year. A standard air compressor will cost $25,000 and will require $500 worth of maintenance each year. Its energy costs will be $10,000 per year. At an interest rate of 12%, which one is preferable?

APPENDIX

BENEFITS AND LIMITATIONS WITH NPV

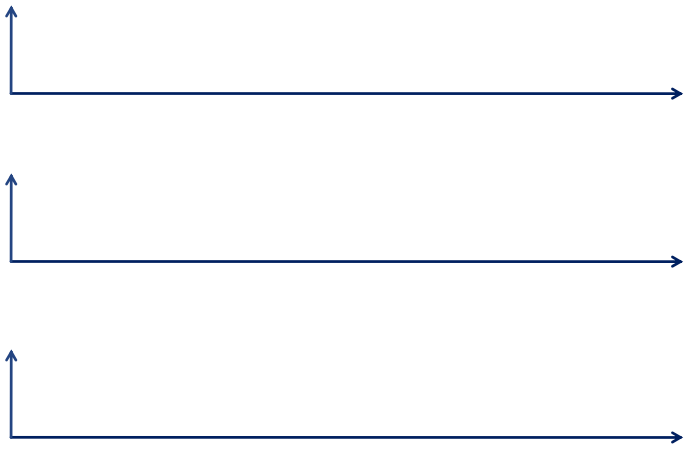
+ Takes into consideration the time value of money
+ Describes the project in terms of dollars
+ Shows amount of value added to the business
+ Uses dollars as measurement
- NPV can be a vague or a misunderstood value
- Doesn't accurately evaluate/ compare mutually exclusive projects with different life spans. To evaluate projects with different lifetimes utilize - Annual Value – which we used here

Or could use Equivalent Annual Annuity Method or Replacement Chain Approach – beyond what we cover – See appendix for equivalent annuity method

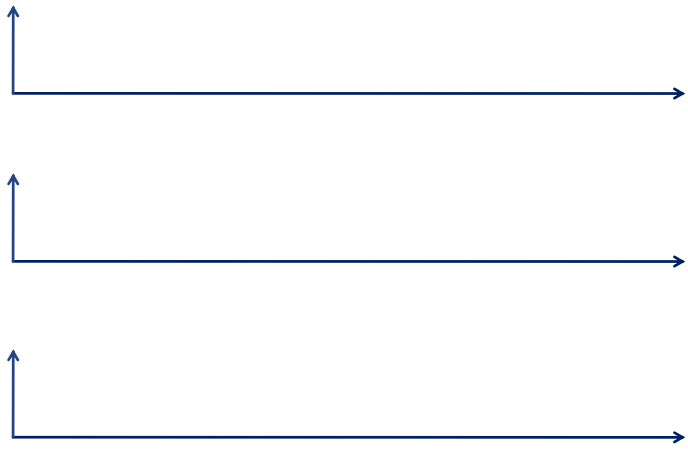
Benefits and Limitations with IRR

+ Focuses on all cash flows with the project
+ Takes into consideration the time value of money
+ Describes the project in terms of the rate of return earned (relatively easy to understand)
- Neglects showing the impact (added value to the Business)
- Dollars make up a businesses cash flows, not percentages
- Ranking Projects by NPV is more accurate (which may yield a different ranking than IRR). This is because we assume we "will keep investing as long as we get MARR or greater."
- Dollars earned must be reinvested to get true IRR, utilize MIRR (Modified IRR – beyond CEM Scope)
- Some projects have multiple IRR's (due to cash flow fluctuations (positive and negative))

Blank Cash Flow Diagrams



Blank Cash Flow Diagrams



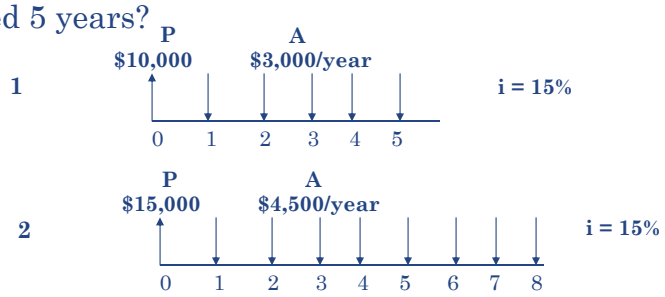
Blank After Cash Flow Diagrams

Year	1 EBITDA	2 Deductions (Depreciation)	3 Taxable Income (1) – (2)	4 Taxes (3) X Rate	5 Income after Taxes (3) – (4)	6 ATCF (5) + (2)
0						
1						
2						
3						
4						
5						

EQUIVALENT ANNUAL ANNUITY METHOD

- Alternate solution method for the example of Insulation thickness choice.
- This method uses EAA – Equivalent Annual Annuity method.
- The comparison numbers are the same as shown earlier, and the project chosen is still the same.

What if Alternative two lasted 8 years and Alternative one lasted 5 years?



Since the project life spans are different, we calculate the Equivalent Annual Annuity of Each Project using the formula

EAA = NPV / (PVIFA) PVIFA = Present Value Interest Factor for an Annuity

Project 1 EAA = NPV1 / (P/A, I%, N) = 56.6 / 3.3522 = $16.884/yr

Project 2 EAA = NPV2 / (P/A, I%, N) = 5,192.85 / 4.4873 = $1,157.23/yr

Since Project 2's EAA is > than Project 1's, select project two

After Tax Cash Flows (ATCF)

- Each year machines lose value but no cash flow occurs
- The US IRS lets us write off the expense from that loss in value (depreciation)
- Depreciation amount is estimated by some structured calculation
- Depreciation impact is to (only) reduce taxes (dep. is not a cash flow), it must be added back in after calculating income after taxes

It is very helpful to know the cash flow impact of a project "after taxes." To do that, we need to understand depreciation and tax calculation. The table format below is useful.

1	2	3	4	5	6
Earnings Before Interest, Taxes, Depreciation And Amortization EBITDA	Deductions	Income before Taxes	Taxes	Income after Taxes	ATCF
	(Depreciation)	(1) – (2)	(3) X Rate	(3) – (4)	(5) + (2)
$50,000	$10,000	$40,000	$12,000	$28,000	$38,000

Example: You are purchasing a waste heat recovery device that will last 5 years. It will cost $100,000 and will save you $30,000 per year before taxes. The salvage value is 0. What is the after tax cash flow each year if your tax rate is 25%? Use straight line depreciation.

Depreciation per year = {($100,000 – 0)/5 years} = $20,000/year

Year	1 EBITDA Before tax cash flow	2 Deductions (Depreciation)	3 Taxable Income (1) – (2)	4 Taxes (3) X Rate	5 Income after Taxes (3) – (4)	6 ATCF (5) + (2)
0	-100,000	0	0	0	--	-100,000
1	30,000	20,000	10,000	2,500	7,500	27,500
2	30,000	20,000	10,000	2,500	7,500	27,500
3	30,000	20,000	10,000	2,500	7,500	27,500
4	30,000	20,000	10,000	2,500	7,500	27,500
5	30,000	20,000	10,000	2,500	7,500	27,500

Note: The Faster you depreciate, the better the NPV on ATCF. Best would be to expense in the first year. (But, IRS usually won't let us.) However, in this course (test), we will use only straight-line depreciation. Faster methods include MACRS (fastest allowed today) and DDB.

MACRS: Modified Accelerated Cost Recovery System
DDB: Double Declining Balance

Note: After calculating ATCF, we can use the same analysis techniques we used on BTCF (IRR, NPV, etc.),but MARR changes.

Investment Tax Credits

- EPACT 05 reintroduces tax credits
- Impact of tax credits much more significant than depreciation.
- Tax credits **reduce taxes (not taxable income) by the amount of the credit.**
- Thus, tax credits are a direct reduction in first cost (after taxes) of that amount.

More on Tax Credits

- Usually depreciable basis is reduced by ½ the tax credit (this can vary; so tax advice should be obtained)
- Tax credits may be subject to depreciation recapture (especially if equipment is sold before end of depreciation period)
- http://www.energy.gov/additionaltaxbreaks.htm

Example: Same example with a 30% tax credit assuming depreciation basis is affected by ½ the credit. (Credit would actually appear in first year)

Depreciation per yr = [($85,000–0)/5 years] = $17,000/yr

Year	1 Before Tax Cash Flow	2 Deduc-tions (Depr)	3 Taxable Income (1) – (2)	4 Taxes (3) X Rate	5 Income After Taxes (3) – (4)	5 After Tax Cash Flow (5) + (2)
0	-100,000	-	-	-30,000 (Credit)	30,000	-70,000
1	30,000	17,000	13,000	3,250	9,750	26,750
2	30,000	17,000	13,000	3,250	9,750	26,750
3	30,000	17,000	13,000	3,250	9,750	26,750
4	30,000	17,000	13,000	3,250	9,750	26,750
5	30,000	17,000	13,000	3,250	9,750	26,750

NPV of Waste Heat Recovery Device With and Without Tax Credit

- Assuming an **after tax MARR of 20%:**
- NPV without tax credit =
  -100,000 + 27,500(P/A, 20%, 5) = -$17,759
  (P/A, 20%, 5) = 2.9906
- NPV with tax credit =
  -70,000 + 26,750(P/A, 20%, 5) = $9,999
- Acceptable project after tax credits

INTEREST TABLES

Time Value of Money Factors - Discrete Compounding
i = 10%

	Single Sums		Uniform Series				Gradient Series	
n	To Find F Given P (F|P,i%,n)	To Find P Given F (P|F,i%,n)	To Find F Given A (F|A,i%,n)	To Find A Given F (A|F,i%,n)	To Find P Given A (P|A,i%,n)	To Find A Given P (A|P,i%,n)	To Find P Given G (P|G,i%,n)	To Find A Given G (A|G,i%,n)
1	1.1000	0.9091	1.0000	1.0000	0.9091	1.1000	0.0000	0.0000
2	1.2100	0.8264	2.1000	0.4762	1.7355	0.5762	0.8264	0.4762
3	1.3310	0.7513	3.3100	0.3021	2.4869	0.4021	2.3291	0.9366
4	1.4641	0.6830	4.6410	0.2155	3.1699	0.3155	4.3781	1.3812
5	1.6105	0.6209	6.1051	0.1638	3.7908	0.2638	6.8618	1.8101
6	1.7716	0.5645	7.7156	0.1296	4.3553	0.2296	9.6842	2.2236
7	1.9487	0.5132	9.4872	0.1054	4.8684	0.2054	12.7631	2.6216
8	2.1436	0.4665	11.4359	0.0874	5.3349	0.1874	16.0287	3.0045
9	2.3579	0.4241	13.5795	0.0736	5.7590	0.1736	19.4215	3.3724
10	2.5937	0.3855	15.9374	0.0627	6.1446	0.1627	22.8913	3.7255
11	2.8531	0.3505	18.5312	0.0540	6.4951	0.1540	26.3963	4.0641
12	3.1384	0.3186	21.3843	0.0468	6.8137	0.1468	29.9012	4.3884
13	3.4523	0.2897	24.5227	0.0408	7.1034	0.1408	33.3772	4.6988
14	3.7975	0.2633	27.9750	0.0357	7.3667	0.1357	36.8005	4.9955
15	4.1772	0.2394	31.7725	0.0315	7.6061	0.1315	40.1520	5.2789
16	4.5950	0.2176	35.9497	0.0278	7.8237	0.1278	43.4164	5.5493
17	5.0545	0.1978	40.5447	0.0247	8.0216	0.1247	46.5819	5.8071
18	5.5599	0.1799	45.5992	0.0219	8.2014	0.1219	49.6395	6.0526
19	6.1159	0.1635	51.1591	0.0195	8.3649	0.1195	52.5827	6.2861
20	6.7275	0.1486	57.2750	0.0175	8.5136	0.1175	55.4069	6.5081
21	7.4002	0.1351	64.0025	0.0156	8.6487	0.1156	58.1095	6.7189
22	8.1403	0.1228	71.4027	0.0140	8.7715	0.1140	60.6893	6.9189
23	8.9543	0.1117	79.5430	0.0126	8.8832	0.1126	63.1462	7.1085
24	9.8497	0.1015	88.4973	0.0113	8.9847	0.1113	65.4813	7.2881
25	10.8347	0.0923	98.3471	0.0102	9.0770	0.1102	67.6964	7.4580
26	11.9182	0.0839	109.1818	9.159E-03	9.1609	0.1092	69.7940	7.6186
27	13.1100	0.0763	121.0999	8.258E-03	9.2372	0.1083	71.7773	7.7704
28	14.4210	0.0693	134.2099	7.451E-03	9.3066	0.1075	73.6495	7.9137
29	15.8631	0.0630	148.6309	6.728E-03	9.3696	0.1067	75.4146	8.0489
30	17.4494	0.0573	164.4940	6.079E-03	9.4269	0.1061	77.0766	8.1762
36	30.9127	0.0323	299.1268	3.343E-03	9.6765	0.1033	85.1194	8.7965
42	54.7637	0.0183	537.6370	1.860E-03	9.8174	0.1019	90.5047	9.2188
48	97.0172	0.0103	960.1723	1.041E-03	9.8969	0.1010	94.0217	9.5001
54	171.8719	5.818E-03	1.709E+03	5.852E-04	9.9418	0.1006	96.2763	9.6840
60	304.4816	3.284E-03	3.035E+03	3.295E-04	9.9672	0.1003	97.7010	9.8023
66	539.4078	1.854E-03	5.384E+03	1.857E-04	9.9815	0.1002	98.5910	9.8774
72	955.5938	1.046E-03	9.546E+03	1.048E-04	9.9895	0.1001	99.1419	9.9246
120	9.271E+04	1.079E-05	9.271E+05	1.079E-06	9.9999	0.1000	99.9860	9.9987
180	2.823E+07	3.543E-08	2.823E+08	3.543E-09	10.0000	0.1000	99.9999	10.0000
360	7.968E+14	1.255E-15	7.968E+15	1.255E-16	10.0000	0.1000	100.0000	10.0000

Time Value of Money Factors - Discrete Compounding
i = 12%

	Single Sums		Uniform Series				Gradient Series	
n	To Find F Given P (F|P,i%,n)	To Find P Given F (P|F,i%,n)	To Find F Given A (F|A,i%,n)	To Find A Given F (A|F,i%,n)	To Find P Given A (P|A,i%,n)	To Find A Given P (A|P,i%,n)	To Find P Given G (P|G,i%,n)	To Find A Given G (A|G,i%,n)
1	1.1200	0.8929	1.0000	1.0000	0.8929	1.1200	0.0000	0.0000
2	1.2544	0.7972	2.1200	0.4717	1.6901	0.5917	0.7972	0.4717
3	1.4049	0.7118	3.3744	0.2963	2.4018	0.4163	2.2208	0.9246
4	1.5735	0.6355	4.7793	0.2092	3.0373	0.3292	4.1273	1.3589
5	1.7623	0.5674	6.3528	0.1574	3.6048	0.2774	6.3970	1.7746
6	1.9738	0.5066	8.1152	0.1232	4.1114	0.2432	8.9302	2.1720
7	2.2107	0.4523	10.0890	0.0991	4.5638	0.2191	11.6443	2.5515
8	2.4760	0.4039	12.2997	0.0813	4.9676	0.2013	14.4714	2.9131
9	2.7731	0.3606	14.7757	0.0677	5.3282	0.1877	17.3563	3.2574
10	3.1058	0.3220	17.5487	0.0570	5.6502	0.1770	20.2541	3.5847
11	3.4785	0.2875	20.6546	0.0484	5.9377	0.1684	23.1288	3.8953
12	3.8960	0.2567	24.1331	0.0414	6.1944	0.1614	25.9523	4.1897
13	4.3635	0.2292	28.0291	0.0357	6.4235	0.1557	28.7024	4.4683
14	4.8871	0.2046	32.3926	0.0309	6.6282	0.1509	31.3624	4.7317
15	5.4736	0.1827	37.2797	0.0268	6.8109	0.1468	33.9202	4.9803
16	6.1304	0.1631	42.7533	0.0234	6.9740	0.1434	36.3670	5.2147
17	6.8660	0.1456	48.8837	0.0205	7.1196	0.1405	38.6973	5.4353
18	7.6900	0.1300	55.7497	0.0179	7.2497	0.1379	40.9080	5.6427
19	8.6128	0.1161	63.4397	0.0158	7.3658	0.1358	42.9979	5.8375
20	9.6463	0.1037	72.0524	0.0139	7.4694	0.1339	44.9676	6.0202
21	10.8038	0.0926	81.6987	0.0122	7.5620	0.1322	46.8188	6.1913
22	12.1003	0.0826	92.5026	0.0108	7.6446	0.1308	48.5543	6.3514
23	13.5523	0.0738	104.6029	9.560E-03	7.7184	0.1296	50.1776	6.5010
24	15.1786	0.0659	118.1552	8.463E-03	7.7843	0.1285	51.6929	6.6406
25	17.0001	0.0588	133.3339	7.500E-03	7.8431	0.1275	53.1046	6.7708
26	19.0401	0.0525	150.3339	6.652E-03	7.8957	0.1267	54.4177	6.8921
27	21.3249	0.0469	169.3740	5.904E-03	7.9426	0.1259	55.6369	7.0049
28	23.8839	0.0419	190.6989	5.244E-03	7.9844	0.1252	56.7674	7.1098
29	26.7499	0.0374	214.5828	4.660E-03	8.0218	0.1247	57.8141	7.2071
30	29.9599	0.0334	241.3327	4.144E-03	8.0552	0.1241	58.7821	7.2974
36	59.1356	0.0169	484.4631	2.064E-03	8.1924	0.1221	63.1970	7.7141
42	116.7231	8.567E-03	964.3595	1.037E-03	8.2619	0.1210	65.8509	7.9704
48	230.3908	4.340E-03	1.912E+03	5.231E-04	8.2972	0.1205	67.4068	8.1241
54	454.7505	2.199E-03	3.781E+03	2.645E-04	8.3150	0.1203	68.3022	8.2143
60	897.5969	1.114E-03	7.472E+03	1.338E-04	8.3240	0.1201	68.8100	8.2664
66	1.772E+03	5.644E-04	1.476E+04	6.777E-05	8.3286	0.1201	69.0948	8.2961
72	3.497E+03	2.860E-04	2.913E+04	3.432E-05	8.3310	0.1200	69.2530	8.3127
120	8.057E+05	1.241E-06	6.714E+06	1.489E-07	8.3333	0.1200	69.4431	8.3332
180	7.232E+08	1.383E-09	6.026E+09	1.659E-10	8.3333	0.1200	69.4444	8.3333
360	5.230E+17	1.912E-18	4.358E+18	2.295E-19	8.3333	0.1200	69.4444	8.3333

Time Value of Money Factors - Discrete Compounding
i = 15%

	Single Sums		Uniform Series				Gradient Series	
n	To Find F Given P (F|P,i%,n)	To Find P Given F (P|F,i%,n)	To Find F Given A (F|A,i%,n)	To Find A Given F (A|F,i%,n)	To Find P Given A (P|A,i%,n)	To Find A Given P (A|P,i%,n)	To Find P Given G (P|G,i%,n)	To Find A Given G (A|G,i%,n)
1	1.1500	0.8696	1.0000	1.0000	0.8696	1.1500	0.0000	0.0000
2	1.3225	0.7561	2.1500	0.4651	1.6257	0.6151	0.7561	0.4651
3	1.5209	0.6575	3.4725	0.2880	2.2832	0.4380	2.0712	0.9071
4	1.7490	0.5718	4.9934	0.2003	2.8550	0.3503	3.7864	1.3263
5	2.0114	0.4972	6.7424	0.1483	3.3522	0.2983	5.7751	1.7228
6	2.3131	0.4323	8.7537	0.1142	3.7845	0.2642	7.9368	2.0972
7	2.6600	0.3759	11.0668	0.0904	4.1604	0.2404	10.1924	2.4498
8	3.0590	0.3269	13.7268	0.0729	4.4873	0.2229	12.4807	2.7813
9	3.5179	0.2843	16.7858	0.0596	4.7716	0.2096	14.7548	3.0922
10	4.0456	0.2472	20.3037	0.0493	5.0188	0.1993	16.9795	3.3832
11	4.6524	0.2149	24.3493	0.0411	5.2337	0.1911	19.1289	3.6549
12	5.3503	0.1869	29.0017	0.0345	5.4206	0.1845	21.1849	3.9082
13	6.1528	0.1625	34.3519	0.0291	5.5831	0.1791	23.1352	4.1438
14	7.0757	0.1413	40.5047	0.0247	5.7245	0.1747	24.9725	4.3624
15	8.1371	0.1229	47.5804	0.0210	5.8474	0.1710	26.6930	4.5650
16	9.3576	0.1069	55.7175	0.0179	5.9542	0.1679	28.2960	4.7522
17	10.7613	0.0929	65.0751	0.0154	6.0472	0.1654	29.7828	4.9251
18	12.3755	0.0808	75.8364	0.0132	6.1280	0.1632	31.1565	5.0843
19	14.2318	0.0703	88.2118	0.0113	6.1982	0.1613	32.4213	5.2307
20	16.3665	0.0611	102.4436	9.761E-03	6.2593	0.1598	33.5822	5.3651
21	18.8215	0.0531	118.8101	8.417E-03	6.3125	0.1584	34.6448	5.4883
22	21.6447	0.0462	137.6316	7.266E-03	6.3587	0.1573	35.6150	5.6010
23	24.8915	0.0402	159.2764	6.278E-03	6.3988	0.1563	36.4988	5.7040
24	28.6252	0.0349	184.1678	5.430E-03	6.4338	0.1554	37.3023	5.7979
25	32.9190	0.0304	212.7930	4.699E-03	6.4641	0.1547	38.0314	5.8834
26	37.8568	0.0264	245.7120	4.070E-03	6.4906	0.1541	38.6918	5.9612
27	43.5353	0.0230	283.5688	3.526E-03	6.5135	0.1535	39.2890	6.0319
28	50.0656	0.0200	327.1041	3.057E-03	6.5335	0.1531	39.8283	6.0960
29	57.5755	0.0174	377.1697	2.651E-03	6.5509	0.1527	40.3146	6.1541
30	66.2118	0.0151	434.7451	2.300E-03	6.5660	0.1523	40.7526	6.2066
36	153.1519	6.529E-03	1.014E+03	9.859E-04	6.6231	0.1510	42.5872	6.4301
42	354.2495	2.823E-03	2.355E+03	4.246E-04	6.6478	0.1504	43.5286	6.5478
48	819.4007	1.220E-03	5.456E+03	1.833E-04	6.6585	0.1502	43.9997	6.6080
54	1.895E+03	5.276E-04	1.263E+04	7.918E-05	6.6631	0.1501	44.2311	6.6382
60	4.384E+03	2.281E-04	2.922E+04	3.422E-05	6.6651	0.1500	44.3431	6.6530
66	1.014E+04	9.861E-05	6.760E+04	1.479E-05	6.6660	0.1500	44.3967	6.6602
72	2.346E+04	4.263E-05	1.564E+05	6.395E-06	6.6664	0.1500	44.4221	6.6636
120	1.922E+07	5.203E-08	1.281E+08	7.805E-09	6.6667	0.1500	44.4444	6.6667
180	8.426E+10	1.187E-11	5.617E+11	1.780E-12	6.6667	0.1500	44.4444	6.6667
360	7.099E+21	1.409E-22	4.733E+22	2.113E-23	6.6667	0.1500	44.4444	6.6667

Time Value of Money Factors - Discrete Compounding
i = 20%

	Single Sums		Uniform Series				Gradient Series	
n	To Find F Given P (F|P,i%,n)	To Find P Given F (P|F,i%,n)	To Find F Given A (F|A,i%,n)	To Find A Given F (A|F,i%,n)	To Find P Given A (P|A,i%,n)	To Find A Given P (A|P,i%,n)	To Find P Given G (P|G,i%,n)	To Find A Given G (A|G,i%,n)
1	1.2000	0.8333	1.0000	1.0000	0.8333	1.2000	0.0000	0.0000
2	1.4400	0.6944	2.2000	0.4545	1.5278	0.6545	0.6944	0.4545
3	1.7280	0.5787	3.6400	0.2747	2.1065	0.4747	1.8519	0.8791
4	2.0736	0.4823	5.3680	0.1863	2.5887	0.3863	3.2986	1.2742
5	2.4883	0.4019	7.4416	0.1344	2.9906	0.3344	4.9061	1.6405
6	2.9860	0.3349	9.9299	0.1007	3.3255	0.3007	6.5806	1.9788
7	3.5832	0.2791	12.9159	0.0774	3.6046	0.2774	8.2551	2.2902
8	4.2998	0.2326	16.4991	0.0606	3.8372	0.2606	9.8831	2.5756
9	5.1598	0.1938	20.7989	0.0481	4.0310	0.2481	11.4335	2.8364
10	6.1917	0.1615	25.9587	0.0385	4.1925	0.2385	12.8871	3.0739
11	7.4301	0.1346	32.1504	0.0311	4.3271	0.2311	14.2330	3.2893
12	8.9161	0.1122	39.5805	0.0253	4.4392	0.2253	15.4667	3.4841
13	10.6993	0.0935	48.4966	0.0206	4.5327	0.2206	16.5883	3.6597
14	12.8392	0.0779	59.1959	0.0169	4.6106	0.2169	17.6008	3.8175
15	15.4070	0.0649	72.0351	0.0139	4.6755	0.2139	18.5095	3.9588
16	18.4884	0.0541	87.4421	0.0114	4.7296	0.2114	19.3208	4.0851
17	22.1861	0.0451	105.9306	9.440E-03	4.7746	0.2094	20.0419	4.1976
18	26.6233	0.0376	128.1167	7.805E-03	4.8122	0.2078	20.6805	4.2975
19	31.9480	0.0313	154.7400	6.462E-03	4.8435	0.2065	21.2439	4.3861
20	38.3376	0.0261	186.6880	5.357E-03	4.8696	0.2054	21.7395	4.4643
21	46.0051	0.0217	225.0256	4.444E-03	4.8913	0.2044	22.1742	4.5334
22	55.2061	0.0181	271.0307	3.690E-03	4.9094	0.2037	22.5546	4.5941
23	66.2474	0.0151	326.2369	3.065E-03	4.9245	0.2031	22.8867	4.6475
24	79.4968	0.0126	392.4842	2.548E-03	4.9371	0.2025	23.1760	4.6943
25	95.3962	0.0105	471.9811	2.119E-03	4.9476	0.2021	23.4276	4.7352
26	114.4755	8.735E-03	567.3773	1.762E-03	4.9563	0.2018	23.6460	4.7709
27	137.3706	7.280E-03	681.8528	1.467E-03	4.9636	0.2015	23.8353	4.8020
28	164.8447	6.066E-03	819.2233	1.221E-03	4.9697	0.2012	23.9991	4.8291
29	197.8136	5.055E-03	984.0680	1.016E-03	4.9747	0.2010	24.1406	4.8527
30	237.3763	4.213E-03	1.182E+03	8.461E-04	4.9789	0.2008	24.2628	4.8731
36	708.8019	1.411E-03	3.539E+03	2.826E-04	4.9929	0.2003	24.7108	4.9491
42	2.116E+03	4.725E-04	1.058E+04	9.454E-05	4.9976	0.2001	24.8890	4.9801
48	6.320E+03	1.582E-04	3.159E+04	3.165E-05	4.9992	0.2000	24.9581	4.9924
54	1.887E+04	5.299E-05	9.435E+04	1.060E-05	4.9997	0.2000	24.9844	4.9971
60	5.635E+04	1.775E-05	2.817E+05	3.549E-06	4.9999	0.2000	24.9942	4.9989
66	1.683E+05	5.943E-06	8.413E+05	1.189E-06	5.0000	0.2000	24.9979	4.9996
72	5.024E+05	1.990E-06	2.512E+06	3.981E-07	5.0000	0.2000	24.9992	4.9999
120	3.175E+09	3.150E-10	1.588E+10	6.299E-11	5.0000	0.2000	25.0000	5.0000
180	1.789E+14	5.590E-15	8.945E+14	1.118E-15	5.0000	0.2000	25.0000	5.0000
360	3.201E+28	3.124E-29	1.600E+29	6.249E-30	5.0000	0.2000	25.0000	5.0000

Time Value of Money Factors - Discrete Compounding
i = 25%

	Single Sums		Uniform Series				Gradient Series	
n	To Find F Given P (F|P,i%,n)	To Find P Given F (P|F,i%,n)	To Find F Given A (F|A,i%,n)	To Find A Given F (A|F,i%,n)	To Find P Given A (P|A,i%,n)	To Find A Given P (A|P,i%,n)	To Find P Given G (P|G,i%,n)	To Find A Given G (A|G,i%,n)
1	1.2500	0.8000	1.0000	1.0000	0.8000	1.2500	0.0000	0.0000
2	1.5625	0.6400	2.2500	0.4444	1.4400	0.6944	0.6400	0.4444
3	1.9531	0.5120	3.8125	0.2623	1.9520	0.5123	1.6640	0.8525
4	2.4414	0.4096	5.7656	0.1734	2.3616	0.4234	2.8928	1.2249
5	3.0518	0.3277	8.2070	0.1218	2.6893	0.3718	4.2035	1.5631
6	3.8147	0.2621	11.2588	0.0888	2.9514	0.3388	5.5142	1.8683
7	4.7684	0.2097	15.0735	0.0663	3.1611	0.3163	6.7725	2.1424
8	5.9605	0.1678	19.8419	0.0504	3.3289	0.3004	7.9469	2.3872
9	7.4506	0.1342	25.8023	0.0388	3.4631	0.2888	9.0207	2.6048
10	9.3132	0.1074	33.2529	0.0301	3.5705	0.2801	9.9870	2.7971
11	11.6415	0.0859	42.5661	0.0235	3.6564	0.2735	10.8460	2.9663
12	14.5519	0.0687	54.2077	0.0184	3.7251	0.2684	11.6020	3.1145
13	18.1899	0.0550	68.7596	0.0145	3.7801	0.2645	12.2617	3.2437
14	22.7374	0.0440	86.9495	0.0115	3.8241	0.2615	12.8334	3.3559
15	28.4217	0.0352	109.6868	0.0091	3.8593	0.2591	13.3260	3.4530
16	35.5271	0.0281	138.1085	0.0072	3.8874	0.2572	13.7482	3.5366
17	44.4089	0.0225	173.6357	5.759E-03	3.9099	0.2558	14.1085	3.6084
18	55.5112	0.0180	218.0446	4.586E-03	3.9279	0.2546	14.4147	3.6698
19	69.3889	0.0144	273.5558	3.656E-03	3.9424	0.2537	14.6741	3.7222
20	86.7362	0.0115	342.9447	2.916E-03	3.9539	0.2529	14.8932	3.7667
21	108.4202	0.0092	429.6809	2.327E-03	3.9631	0.2523	15.0777	3.8045
22	135.5253	0.0074	538.1011	1.858E-03	3.9705	0.2519	15.2326	3.8365
23	169.4066	0.0059	673.6264	1.485E-03	3.9764	0.2515	15.3625	3.8634
24	211.7582	0.0047	843.0329	1.186E-03	3.9811	0.2512	15.4711	3.8861
25	264.6978	0.0038	1054.7912	9.481E-04	3.9849	0.2509	15.5618	3.9052
26	330.8722	3.022E-03	1319.4890	7.579E-04	3.9879	0.2508	15.6373	3.9212
27	413.5903	2.418E-03	1650.3612	6.059E-04	3.9903	0.2506	15.7002	3.9346
28	516.9879	1.934E-03	2063.9515	4.845E-04	3.9923	0.2505	15.7524	3.9457
29	646.2349	1.547E-03	2580.9394	3.875E-04	3.9938	0.2504	15.7957	3.9551
30	807.7936	1.238E-03	3.227E+03	3.099E-04	3.9950	0.2503	15.8316	3.9628
36	3081.4879	3.245E-04	1.232E+04	8.116E-05	3.9987	0.2501	15.9481	3.9883
42	1.175E+04	8.507E-05	4.702E+04	2.127E-05	3.9997	0.2500	15.9843	3.9964
48	4.484E+04	2.230E-05	1.794E+05	5.575E-06	3.9999	0.2500	15.9954	3.9989
54	1.711E+05	5.846E-06	6.842E+05	1.462E-06	4.0000	0.2500	15.9986	3.9997
60	6.525E+05	1.532E-06	2.610E+06	3.831E-07	4.0000	0.2500	15.9996	3.9999
66	2.489E+06	4.017E-07	9.957E+06	1.004E-07	4.0000	0.2500	15.9999	4.0000
72	9.496E+06	1.053E-07	3.798E+07	2.633E-08	4.0000	0.2500	16.0000	4.0000
120	4.258E+11	2.349E-12	1.703E+12	5.871E-13	4.0000	0.2500	16.0000	4.0000
180	2.778E+17	3.599E-18	1.111E+18	8.998E-19	4.0000	0.2500	16.0000	4.0000
360	7.720E+34	1.295E-35	3.088E+35	3.238E-36	4.0000	0.2500	16.0000	4.0000

Time Value of Money Factors - Discrete Compounding
i = 30%

	Single Sums		Uniform Series				Gradient Series	
n	To Find F Given P (F|P,i%,n)	To Find P Given F (P|F,i%,n)	To Find F Given A (F|A,i%,n)	To Find A Given F (A|F,i%,n)	To Find P Given A (P|A,i%,n)	To Find A Given P (A|P,i%,n)	To Find P Given G (P|G,i%,n)	To Find A Given G (A|G,i%,n)
1	1.3000	0.7692	1.0000	1.0000	0.7692	1.3000	0.0000	0.0000
2	1.6900	0.5917	2.3000	0.4348	1.3609	0.7348	0.5917	0.4348
3	2.1970	0.4552	3.9900	0.2506	1.8161	0.5506	1.5020	0.8271
4	2.8561	0.3501	6.1870	0.1616	2.1662	0.4616	2.5524	1.1783
5	3.7129	0.2693	9.0431	0.1106	2.4356	0.4106	3.6297	1.4903
6	4.8268	0.2072	12.7560	0.0784	2.6427	0.3784	4.6656	1.7654
7	6.2749	0.1594	17.5828	0.0569	2.8021	0.3569	5.6218	2.0063
8	8.1573	0.1226	23.8577	0.0419	2.9247	0.3419	6.4800	2.2156
9	10.6045	0.0943	32.0150	0.0312	3.0190	0.3312	7.2343	2.3963
10	13.7858	0.0725	42.6195	0.0235	3.0915	0.3235	7.8872	2.5512
11	17.9216	0.0558	56.4053	0.0177	3.1473	0.3177	8.4452	2.6833
12	23.2981	0.0429	74.3270	0.0135	3.1903	0.3135	8.9173	2.7952
13	30.2875	0.0330	97.6250	0.0102	3.2233	0.3102	9.3135	2.8895
14	39.3738	0.0254	127.9125	7.818E-03	3.2487	0.3078	9.6437	2.9685
15	51.1859	0.0195	167.2863	5.978E-03	3.2682	0.3060	9.9172	3.0344
16	66.5417	0.0150	218.4722	4.577E-03	3.2832	0.3046	10.1426	3.0892
17	86.5042	0.0116	285.0139	3.509E-03	3.2948	0.3035	10.3276	3.1345
18	112.4554	8.892E-03	371.5180	2.692E-03	3.3037	0.3027	10.4788	3.1718
19	146.1920	6.840E-03	483.9734	2.066E-03	3.3105	0.3021	10.6019	3.2025
20	190.0496	5.262E-03	630.1655	1.587E-03	3.3158	0.3016	10.7019	3.2275
21	247.0645	4.048E-03	820.2151	1.219E-03	3.3198	0.3012	10.7828	3.2480
22	321.1839	3.113E-03	1.067E+03	9.370E-04	3.3230	0.3009	10.8482	3.2646
23	417.5391	2.395E-03	1.388E+03	7.202E-04	3.3254	0.3007	10.9009	3.2781
24	542.8008	1.842E-03	1.806E+03	5.537E-04	3.3272	0.3006	10.9433	3.2890
25	705.6410	1.417E-03	2.349E+03	4.257E-04	3.3286	0.3004	10.9773	3.2979
26	917.3333	1.090E-03	3.054E+03	3.274E-04	3.3297	0.3003	11.0045	3.3050
27	1.193E+03	8.386E-04	3.972E+03	2.518E-04	3.3305	0.3003	11.0263	3.3107
28	1.550E+03	6.450E-04	5.164E+03	1.936E-04	3.3312	0.3002	11.0437	3.3153
29	2.015E+03	4.962E-04	6.715E+03	1.489E-04	3.3317	0.3001	11.0576	3.3189
30	2.620E+03	3.817E-04	8.730E+03	1.145E-04	3.3321	0.3001	11.0687	3.3219
36	1.265E+04	7.908E-05	4.215E+04	2.372E-05	3.3331	0.3000	11.1007	3.3305
42	6.104E+04	1.638E-05	2.035E+05	4.915E-06	3.3333	0.3000	11.1086	3.3326
48	2.946E+05	3.394E-06	9.821E+05	1.018E-06	3.3333	0.3000	11.1105	3.3332
54	1.422E+06	7.032E-07	4.740E+06	2.110E-07	3.3333	0.3000	11.1110	3.3333
60	6.864E+06	1.457E-07	2.288E+07	4.370E-08	3.3333	0.3000	11.1111	3.3333
66	3.313E+07	3.018E-08	1.104E+08	9.054E-09	3.3333	0.3000	11.1111	3.3333
72	1.599E+08	6.253E-09	5.331E+08	1.876E-09	3.3333	0.3000	11.1111	3.3333
120	4.712E+13	2.122E-14	1.571E+14	6.367E-15	3.3333	0.3000	11.1111	3.3333
180	3.234E+20	3.092E-21	1.078E+21	9.275E-22	3.3333	0.3000	11.1111	3.3333
360	1.046E+41	9.559E-42	3.487E+41	2.868E-42	3.3333	0.3000	11.1111	3.3333

Time Value of Money Factors - Discrete Compounding
i = 40%

	Single Sums		Uniform Series				Gradient Series	
n	To Find F Given P (F|P,i%,n)	To Find P Given F (P|F,i%,n)	To Find F Given A (F|A,i%,n)	To Find A Given F (A|F,i%,n)	To Find P Given A (P|A,i%,n)	To Find A Given P (A|P,i%,n)	To Find P Given G (P|G,i%,n)	To Find A Given G (A|G,i%,n)
1	1.4000	0.7143	1.0000	1.0000	0.7143	1.4000	0.0000	0.0000
2	1.9600	0.5102	2.4000	0.4167	1.2245	0.8167	0.5102	0.4167
3	2.7440	0.3644	4.3600	0.2294	1.5889	0.6294	1.2391	0.7798
4	3.8416	0.2603	7.1040	0.1408	1.8492	0.5408	2.0200	1.0923
5	5.3782	0.1859	10.9456	0.0914	2.0352	0.4914	2.7637	1.3580
6	7.5295	0.1328	16.3238	0.0613	2.1680	0.4613	3.4278	1.5811
7	10.5414	0.0949	23.8534	0.0419	2.2628	0.4419	3.9970	1.7664
8	14.7579	0.0678	34.3947	0.0291	2.3306	0.4291	4.4713	1.9185
9	20.6610	0.0484	49.1526	0.0203	2.3790	0.4203	4.8585	2.0422
10	28.9255	0.0346	69.8137	0.0143	2.4136	0.4143	5.1696	2.1419
11	40.4957	0.0247	98.7391	0.0101	2.4383	0.4101	5.4166	2.2215
12	56.6939	0.0176	139.2348	0.0072	2.4559	0.4072	5.6106	2.2845
13	79.3715	0.0126	195.9287	0.0051	2.4685	0.4051	5.7618	2.3341
14	111.1201	0.0090	275.3002	0.0036	2.4775	0.4036	5.8788	2.3729
15	155.5681	0.0064	386.4202	0.0026	2.4839	0.4026	5.9688	2.4030
16	217.7953	0.0046	541.9883	0.0018	2.4885	0.4018	6.0376	2.4262
17	304.9135	0.0033	759.7837	1.316E-03	2.4918	0.4013	6.0901	2.4441
18	426.8789	0.0023	1064.6971	9.392E-04	2.4941	0.4009	6.1299	2.4577
19	597.6304	0.0017	1491.5760	6.704E-04	2.4958	0.4007	6.1601	2.4682
20	836.6826	0.0012	2089.2064	4.787E-04	2.4970	0.4005	6.1828	2.4761
21	1171.3556	0.0009	2925.8889	3.418E-04	2.4979	0.4003	6.1998	2.4821
22	1639.8978	0.0006	4097.2445	2.441E-04	2.4985	0.4002	6.2127	2.4866
23	2295.8569	0.0004	5737.1423	1.743E-04	2.4989	0.4002	6.2222	2.4900
24	3214.1997	0.0003	8032.9993	1.245E-04	2.4992	0.4001	6.2294	2.4925
25	4499.8796	0.0002	11247.1990	8.891E-05	2.4994	0.4001	6.2347	2.4944
26	6299.8314	1.587E-04	15747.0785	6.350E-05	2.4996	0.4001	6.2387	2.4959
27	8819.7640	1.134E-04	22046.9099	4.536E-05	2.4997	0.4000	6.2416	2.4969
28	12347.6696	8.099E-05	30866.6739	3.240E-05	2.4998	0.4000	6.2438	2.4977
29	17286.7374	5.785E-05	43214.3435	2.314E-05	2.4999	0.4000	6.2454	2.4983
30	24201.4324	4.132E-05	6.050E+04	1.653E-05	2.4999	0.4000	6.2466	2.4988
36	##########	5.488E-06	4.556E+05	2.195E-06	2.5000	0.4000	6.2495	2.4998
42	1.372E+06	7.288E-07	3.430E+06	2.915E-07	2.5000	0.4000	6.2499	2.5000
48	1.033E+07	9.680E-08	2.583E+07	3.872E-08	2.5000	0.4000	6.2500	2.5000
54	7.779E+07	1.286E-08	1.945E+08	5.142E-09	2.5000	0.4000	6.2500	2.5000
60	5.857E+08	1.707E-09	1.464E+09	6.829E-10	2.5000	0.4000	6.2500	2.5000
66	4.410E+09	2.268E-10	1.103E+10	9.070E-11	2.5000	0.4000	6.2500	2.5000
72	3.321E+10	3.011E-11	8.302E+10	1.205E-11	2.5000	0.4000	6.2500	2.5000
120	3.431E+17	2.915E-18	8.576E+17	1.166E-18	2.5000	0.4000	6.2500	2.5000
180	2.009E+26	4.977E-27	5.023E+26	1.991E-27	2.5000	0.4000	6.2500	2.5000
360	4.037E+52	2.477E-53	1.009E+53	9.908E-54	2.5000	0.4000	6.2500	2.5000

Time Value of Money Factors - Discrete Compounding
i = 50%

	Single Sums		Uniform Series				Gradient Series	
n	To Find F Given P (F|P,i%,n)	To Find P Given F (P|F,i%,n)	To Find F Given A (F|A,i%,n)	To Find A Given F (A|F,i%,n)	To Find P Given A (P|A,i%,n)	To Find A Given P (A|P,i%,n)	To Find P Given G (P|G,i%,n)	To Find A Given G (A|G,i%,n)
1	1.5000	0.6667	1.0000	1.0000	0.6667	1.5000	0.0000	0.0000
2	2.2500	0.4444	2.5000	0.4000	1.1111	0.9000	0.4444	0.4000
3	3.3750	0.2963	4.7500	0.2105	1.4074	0.7105	1.0370	0.7368
4	5.0625	0.1975	8.1250	0.1231	1.6049	0.6231	1.6296	1.0154
5	7.5938	0.1317	13.1875	0.0758	1.7366	0.5758	2.1564	1.2417
6	11.3906	0.0878	20.7813	0.0481	1.8244	0.5481	2.5953	1.4226
7	17.0859	0.0585	32.1719	0.0311	1.8829	0.5311	2.9465	1.5648
8	25.6289	0.0390	49.2578	0.0203	1.9220	0.5203	3.2196	1.6752
9	38.4434	0.0260	74.8867	0.0134	1.9480	0.5134	3.4277	1.7596
10	57.6650	0.0173	113.3301	0.0088	1.9653	0.5088	3.5838	1.8235
11	86.4976	0.0116	170.9951	0.0058	1.9769	0.5058	3.6994	1.8713
12	129.7463	0.0077	257.4927	0.0039	1.9846	0.5039	3.7842	1.9068
13	194.6195	0.0051	387.2390	0.0026	1.9897	0.5026	3.8459	1.9329
14	291.9293	0.0034	581.8585	0.0017	1.9931	0.5017	3.8904	1.9519
15	437.8939	0.0023	873.7878	0.0011	1.9954	0.5011	3.9224	1.9657
16	656.8408	0.0015	1311.6817	0.0008	1.9970	0.5008	3.9452	1.9756
17	985.2613	0.0010	1968.5225	5.080E-04	1.9980	0.5005	3.9614	1.9827
18	1477.8919	0.0007	2953.7838	3.385E-04	1.9986	0.5003	3.9729	1.9878
19	2216.8378	0.0005	4431.6756	2.256E-04	1.9991	0.5002	3.9811	1.9914
20	3325.2567	0.0003	6648.5135	1.504E-04	1.9994	0.5002	3.9868	1.9940
21	4987.8851	0.0002	9973.7702	1.003E-04	1.9996	0.5001	3.9908	1.9958
22	7481.8276	0.0001	14961.6553	6.684E-05	1.9997	0.5001	3.9936	1.9971
23	11222.7415	0.0001	22443.4829	4.456E-05	1.9998	0.5000	3.9955	1.9980
24	16834.1122	0.0001	33666.2244	2.970E-05	1.9999	0.5000	3.9969	1.9986
25	25251.1683	0.0000	50500.3366	1.980E-05	1.9999	0.5000	3.9979	1.9990
26	37876.7524	2.640E-05	75751.5049	1.320E-05	1.9999	0.5000	3.9985	1.9993
27	56815.1287	1.760E-05	113628.257	8.801E-06	2.0000	0.5000	3.9990	1.9995
28	85222.6930	1.173E-05	170443.386	5.867E-06	2.0000	0.5000	3.9993	1.9997
29	127834.039	7.823E-06	255666.079	3.911E-06	2.0000	0.5000	3.9995	1.9998
30	191751.059	5.215E-06	3.835E+05	2.608E-06	2.0000	0.5000	3.9997	1.9998
36	2184164.41	4.578E-07	4.368E+06	2.289E-07	2.0000	0.5000	4.0000	2.0000
42	2.488E+07	4.019E-08	4.976E+07	2.010E-08	2.0000	0.5000	4.0000	2.0000
48	2.834E+08	3.529E-09	5.668E+08	1.764E-09	2.0000	0.5000	4.0000	2.0000
54	3.228E+09	3.098E-10	6.456E+09	1.549E-10	2.0000	0.5000	4.0000	2.0000
60	3.677E+10	2.720E-11	7.354E+10	1.360E-11	2.0000	0.5000	4.0000	2.0000
66	4.188E+11	2.388E-12	8.376E+11	1.194E-12	2.0000	0.5000	4.0000	2.0000
72	4.771E+12	2.096E-13	9.541E+12	1.048E-13	2.0000	0.5000	4.0000	2.0000
120	1.352E+21	7.397E-22	2.704E+21	3.698E-22	2.0000	0.5000	4.0000	2.0000
180	4.971E+31	2.012E-32	9.942E+31	1.006E-32	2.0000	0.5000	4.0000	2.0000
360	2.471E+63	4.047E-64	4.942E+63	2.024E-64	2.0000	0.5000	4.0000	2.0000

END OF SECTION I